

Philadelphia College of Osteopathic Medicine DigitalCommons@PCOM

PCOM Scholarly Papers

1985

Pulmonary Function Manual

John P. Simelaro

Philadelphia College of Osteopathic Medicine, johns@pcom.edu

Follow this and additional works at: http://digitalcommons.pcom.edu/scholarly_papers



Part of the [Medicine and Health Sciences Commons](#)

Recommended Citation

Simelaro, John P., "Pulmonary Function Manual" (1985). *PCOM Scholarly Papers*. Paper 218.
http://digitalcommons.pcom.edu/scholarly_papers/218

This Book is brought to you for free and open access by DigitalCommons@PCOM. It has been accepted for inclusion in PCOM Scholarly Papers by an authorized administrator of DigitalCommons@PCOM. For more information, please contact library@pcom.edu.

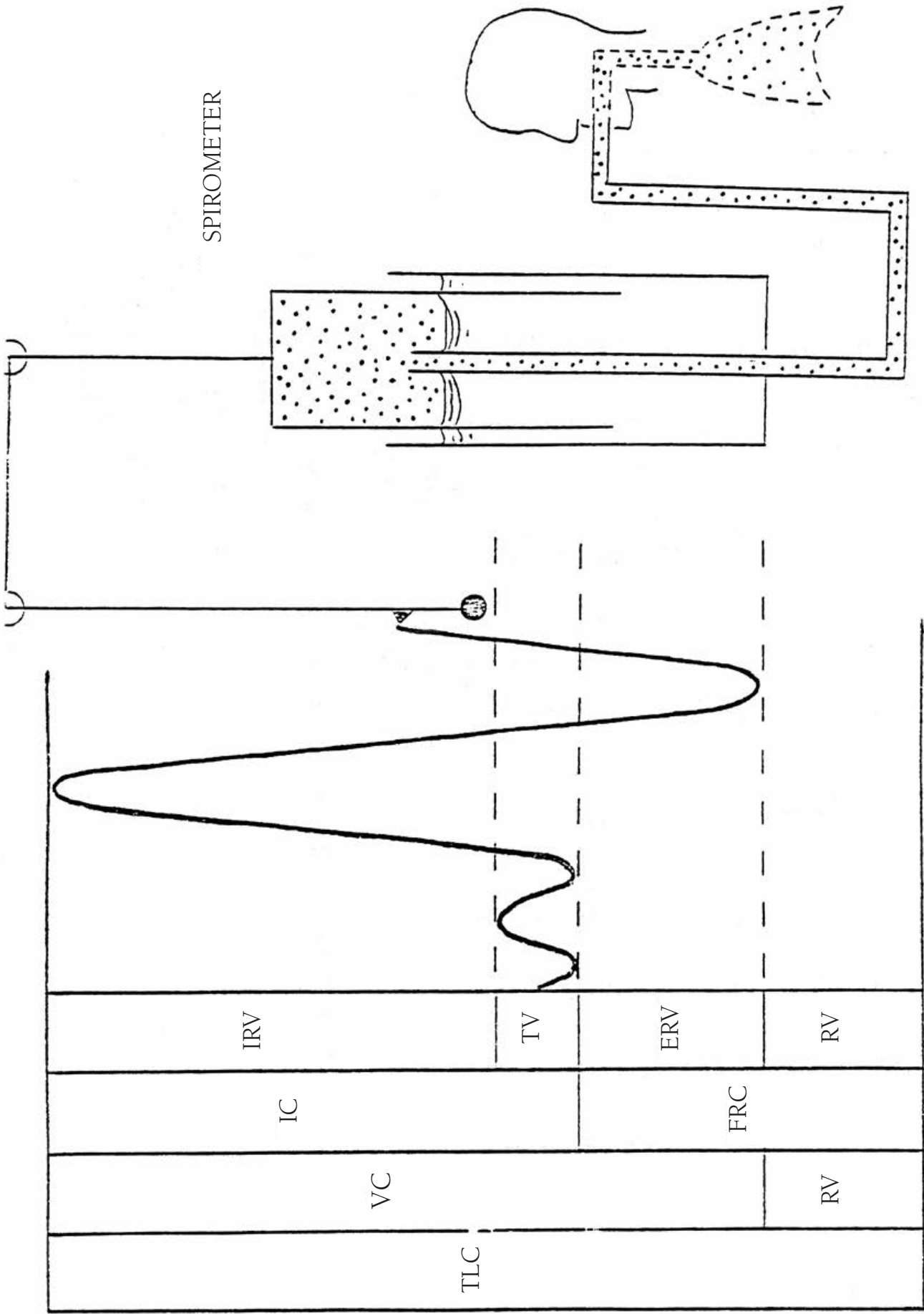
Pulmonary Function Manual

John P. Simelaro, D.O., FCCP, FACOI, FACA

Chairman, Department of Internal Medicine

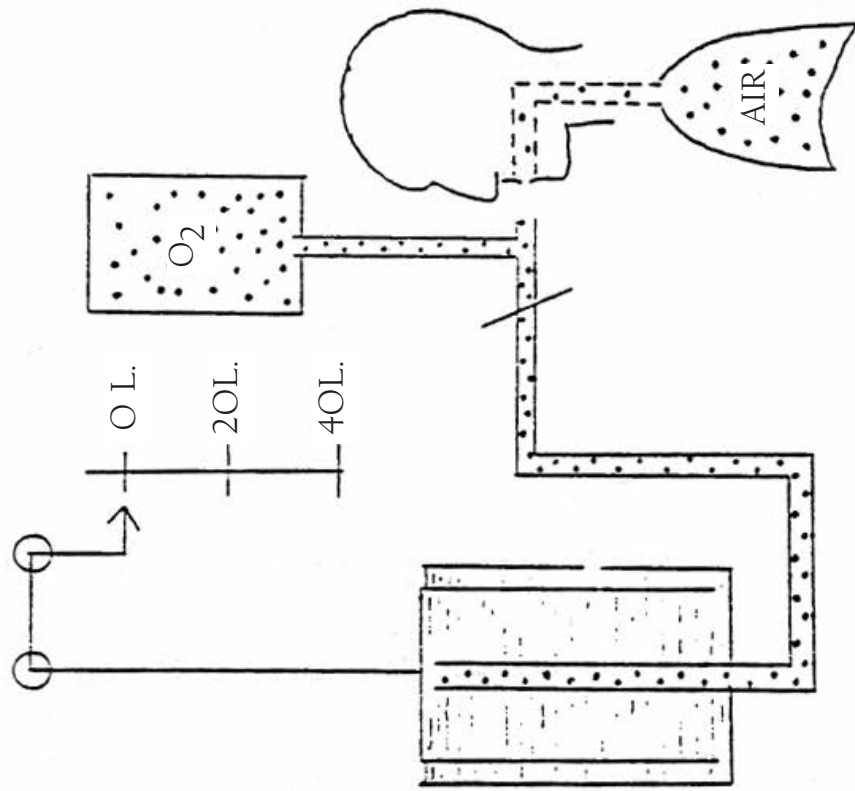
Chairman, Division of Pulmonary Medicine

Philadelphia College of Osteopathic Medicine

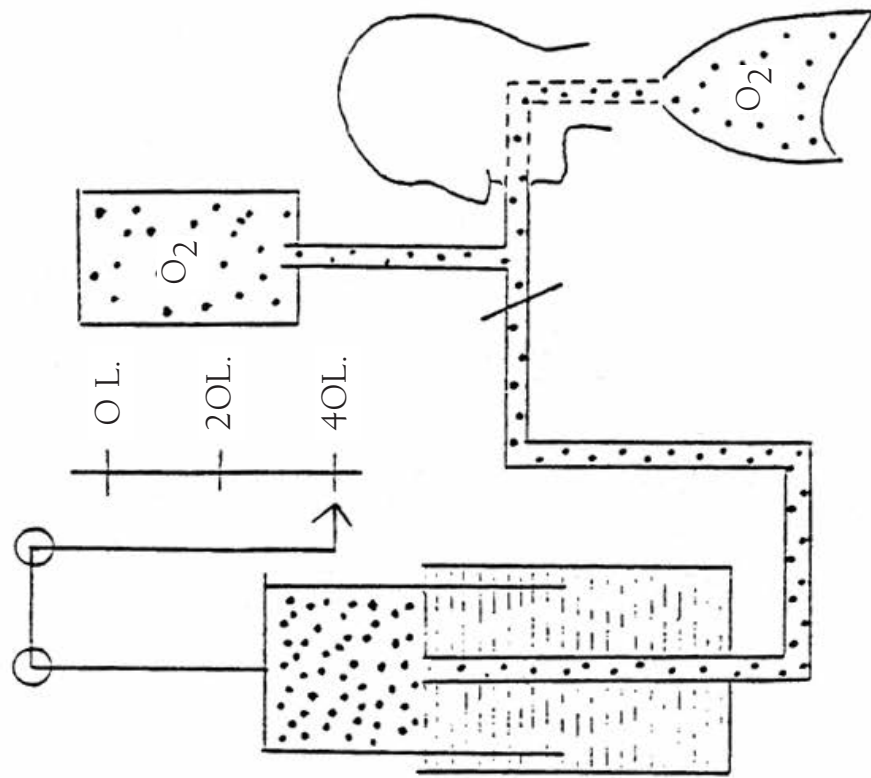


LUNG VOLUMES

MEASUREMENT OF FUNCTIONAL RESIDUAL CAPACITY -- OPEN CIRCUIT METHOD
NITROGEN WASH OUT

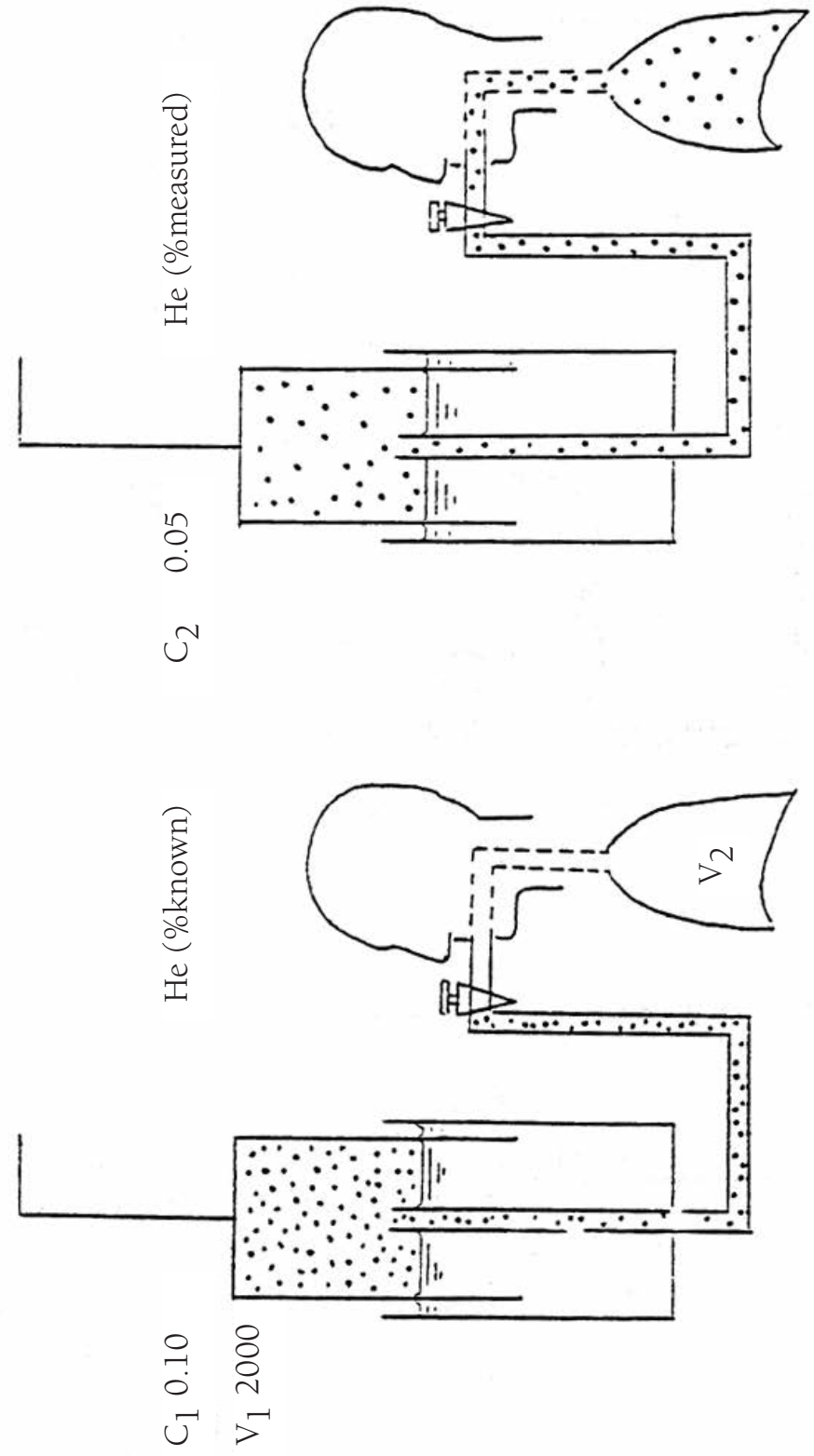


Before Test -- no air in spirometer



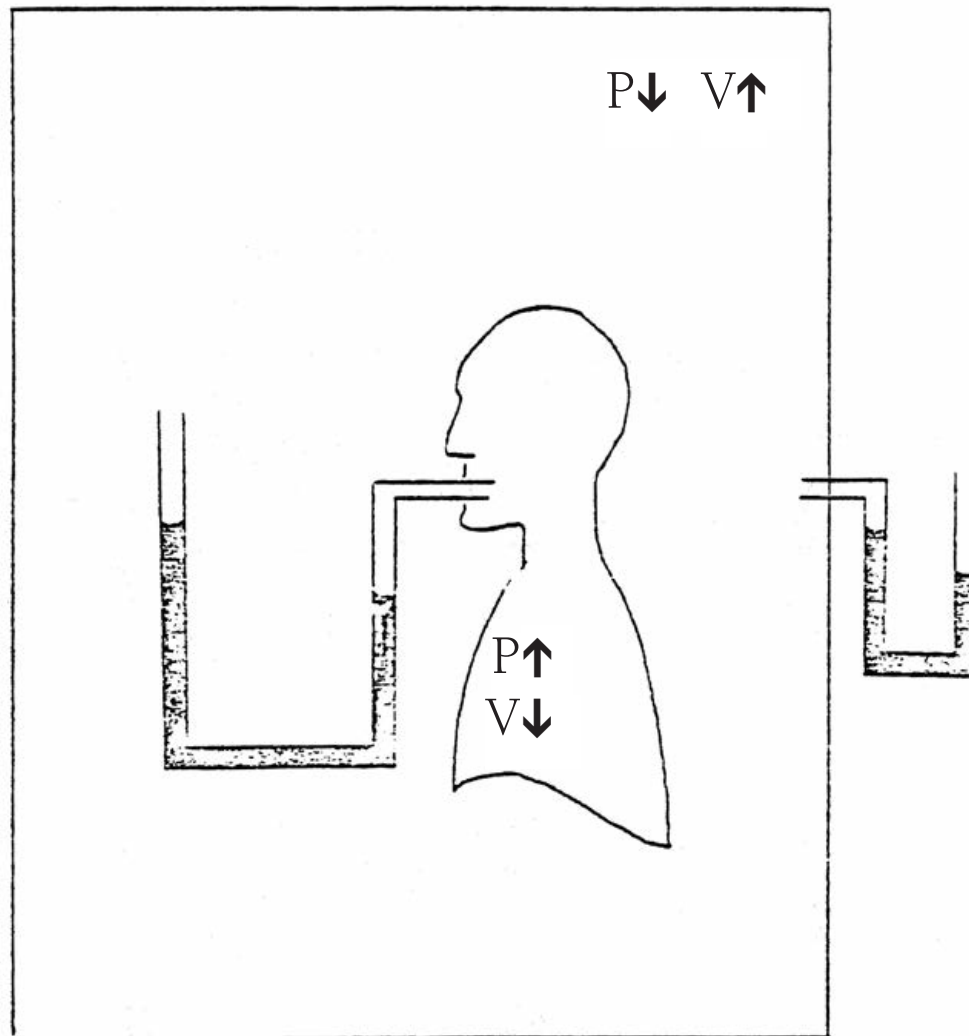
1. After Test -- 40,000ml. air plus O_2
2. N_2 % in spirometer -- 5%
3. Amt. of N_2 40,000ml x .05 = 2000ml
4. Since 2000ml. N_2 existed in the lungs as
 80% N_2 then total alveolar gas:
 $2000 \times \frac{100}{80} = 2500\text{ml.}$

MEASUREMENT OF FUNCTIONAL RESIDUAL CAPACITY BY He DILUTION



He BEFORE EQUILIBRATION	He AFTER EQUILIBRATION
Amt. He in lungs + Amt. He in bellows	Amt. He in lungs + bellows
$V_2 C_2 + V_1 C_1$	$(V_2 + V_1) \times C_1 \text{ or } C_2$
$0 + (2000 \times 0.10)$	$(V_2 + 2000) \times 0.05$
	2000
	V_2

MEASUREMENT OF FRC WITH THE BODY PLETHSMOGRAPH



1. Patient makes a respiratory effort against a closed mouthpiece.
2. As he exhales, he compresses the gas in his lungs, lung volume decreases and the box pressure falls since its gas volume increases.
3. Boyle's Law: $P \times V$ is constant
4. Application: $P_1 V = P_2 (V - \Delta V)$ P_1 and P_2 = mouth press
 $V = \text{FRC}$

SIGNIFICANCE OF INCREASE IN THE FUNCTIONAL RESIDUAL CAPACITY

A. Represents HYPERINFLATION not emphysema.

B. Increased FRC results from:

1. Structual changes -- as occurs in emphysema, either the disease itself or part of the natural aging process.
2. Partial obstruction to an airway -- predominately expiratory as in asthma.
3. Compensatory overinflation following surgical removal of lung tissue.
4. Deformity of the thorax

SIGNIFICANCE OF CHANGES IN THE RESIDUAL VOLUME / TLC

Normal RV / TLC is between 20% and 35%.

Increased if the RV is increased as in asthma or emphysema, OR TLC is decreased as in pulmonary restrictive diseases or congestion.

ANATOMIC AND PHYSIOLOGIC DEAD SPACE

Anatomic Dead Space -- volume of the conducting airways down to the level where the rapid dilution of inspired air occurs with gas already in the lung.

Physiologic Dead Space -- volume of the lung which does not eliminate CO₂.

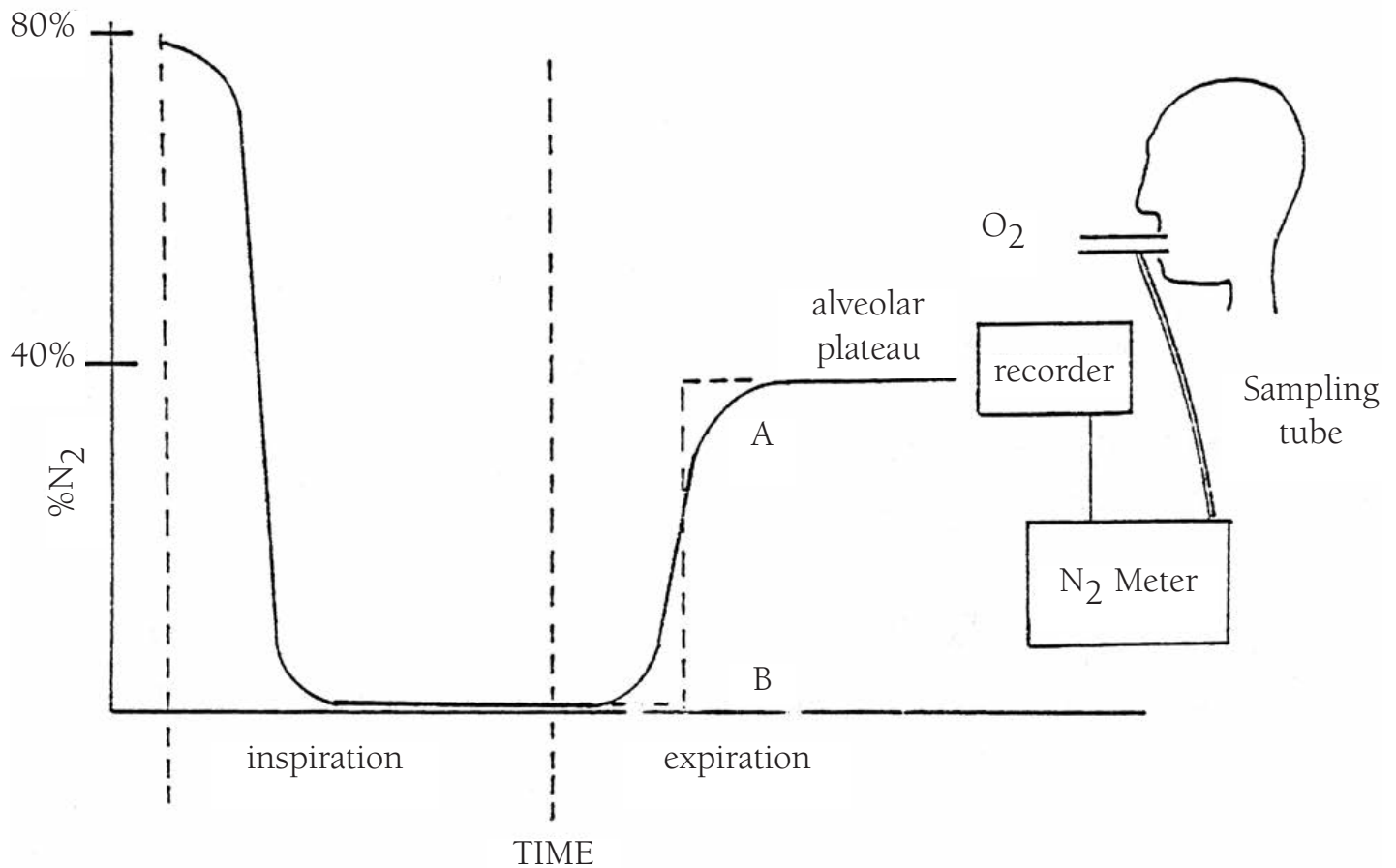
In normal subjects, the anatomic and physiologic dead space are nearly the same. But in patients with lung disease the physiologic dead space may be considerably larger because of the inequality of blood flow and ventilation in the lung.

BOHR'S METHOD OF MEASURING THE PHYSIOLOGIC DEAD SPACE

1. Bohr's method measures the volume of the lung which does not eliminate CO₂.
2. In normal subjects the anatomic and the physiologic dead spaces are nearly equal.
3. In patients with lung disease the physiologic dead space may be considerably larger because of inequality of blood flow and ventilation within the lung.
4. Bohr's Equation: all expired CO₂ comes from the alveolar gas and none from the dead space.

	$V_T \cdot F_E = V_A \cdot F_A$
But	$V_A = V_T - V_D$
Substituting	$V_T \cdot F_E = (V_T - V_D) \cdot F_A$
Whence	$\frac{V_D}{V_T} = \frac{F_A - F_E}{F_A}$
Thus	$\frac{V_D}{V_T} = \frac{P_{ACO2} - P_{ECO2}}{P_{ACO2}}$

FOWLER'S METHOD OF MEASURING THE ANATOMIC DEAD SPACE



The dead space is the expired volume up to the vertical broken line which makes areas A and B equal. The Anatomic Dead Space is the volume of the conducting airways down to the level where the rapid dilution of inspired gas occurs with gas already in the lung.

VENTILATION

$$V_T = V_D + V_A$$

therefore $V_{Tn} = V_{Dn} + V_{An}$

where n is frequency of respiration

therefore $\dot{V}_E = \dot{V}_D + \dot{V}_A$

Thus $\dot{V}_A = \dot{V}_E - \dot{V}_D$

OR $V_A = (TV - DS) R$

MEASUREMENT OF DIFFUSING CAPACITY

FICK'S LAW; the rate of transfer of a gas through a sheet of tissue is proportional to the tissue area and the difference in gas concentration between the two sides, and inversely proportional to the tissue thickness.

$$\dot{V}_{\text{gas}} = \frac{A}{T} \cdot D \cdot (P_1 - P_2)$$

Not possible to measure A and T during life, so:

$$\dot{V}_{\text{gas}} = D_L \cdot D \cdot (P_1 - P_2)$$

where D_L is called the diffusing capacity and includes A and

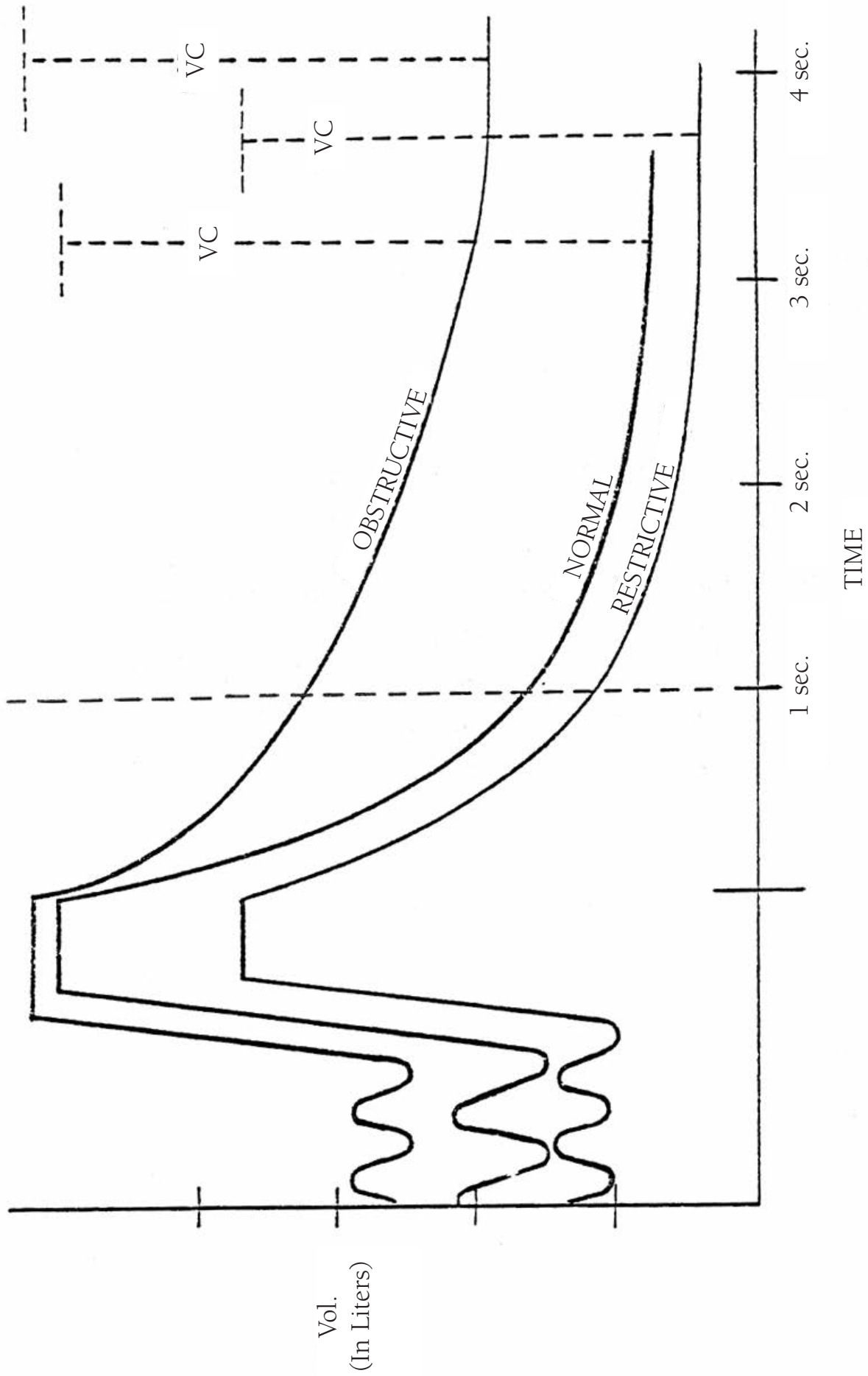
$$D_L = \frac{\dot{V}_{\text{CO}}}{(P_1 - P_2)}$$

P_1 and P_2 are the partial pressures of alveolar gas and capillary blood. Since CO in capillary blood is so small, it can be neglected, hence:

$$D_L = \frac{\dot{V}_{\text{CO}}}{P_{\text{A}_{\text{CO}}}}$$

DIFFUSING CAPACITIES IN PATIENTS WITH CARDIOPULMONARY DISEASE

1. Alveolar-capillary block; includes disease associated with thickening and separation of the capillary and alveolar wall.
Due to FIBROSIS or EDEMA FLUID.
Examples: sarcoidosis, berylliosis, scleroderma, CHF.
2. Chronic Obstructive Emphysema; usually not due to alveolar capillary block a decrease in surface area for gas exchange.
3. Loss of Pulmonary Tissue; the total surface area of the capillaries is decreased as in pneumonectomy or space-taking lesion of the lung.
4. Vascular Disorders; any abnormality which occludes the arterial flow to part of the lung.
Example: congenital absence of, or embolic occlusion of a pulmonary artery.
5. Anemia and Ploicythemia; decreased in anemia due to decreased amount of red cells, early CHF, or because RBC in pulmonary capillary at any instant cannot absorb all the gas. May be increased in Ploicythemia.



FORCED EXPIRATORY VOLUMES

VENTILATION – FORCED EXPIRATION

1. Normal Pattern: $FEV_{1\%}$ greater than 80%

2. Obstructive Pattern:

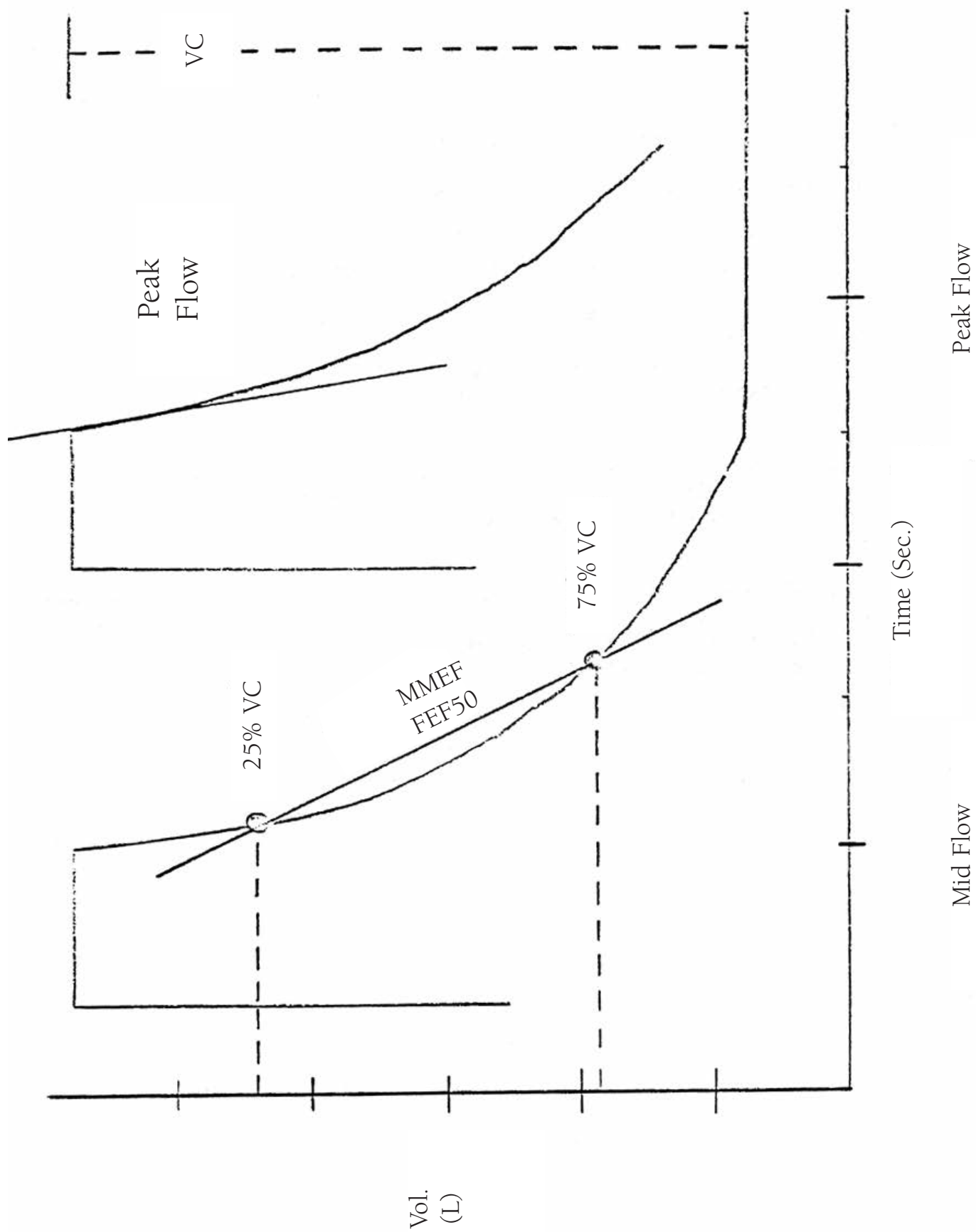
	<u>$FEV_{1\%}$</u>
Mild	70% – 55%
Moderate	54% – 45%
Severe	↓ – 45%

3. Restrictive Disease: All lung volumes ↓ (FVC, FRC or RV)

	<u>FVC</u>	<u>FRC or RV</u>
Mild	79% – 65%	↓ 80%
Moderate	64% – 50%	↓ 80%
Severe	↓ – 45%	↓ 80%

Rv ↑ 125% - - - - - Hyperinflation

BRONCHODOLATORS ↑ 25% in Volumes or Flows is a good response.



CAUSES OF OBSTRUCTIVE PATTERNS – (can't get air out)

Increased Resistance to airflow can be caused by:

A. Inside Lumen

1. Chronic bronchitis – Excessive secretions
2. Bronchiectasis
3. Acute Pulmonary Edema
4. Aspiration
5. Post Op retained secretions
6. Inhaled foreign bodies

B. Wall of Lumen

1. Asthma contraction of bronchial smooth muscle.
2. Chronic bronchitis – Hypertrophy of mucous glands.
3. Inflammation + edema - asthma + bronchitis

C. Outside Lumen

1. Emphysema - Destruction causes loss of radial traction and narrowing.
2. Enlarged lymph nodes or neoplasm.
3. Peribronchial edema.

CAUSES OF RESTRICTIVE DISEASE – (can't get air in)

Expansion of lung is restricted either because of alterations in the lung parenchyma, diseases of pleura, chest wall, or neuromuscular apparatus.

A. Diffuse Interstitial Pulmonary Fibrosis

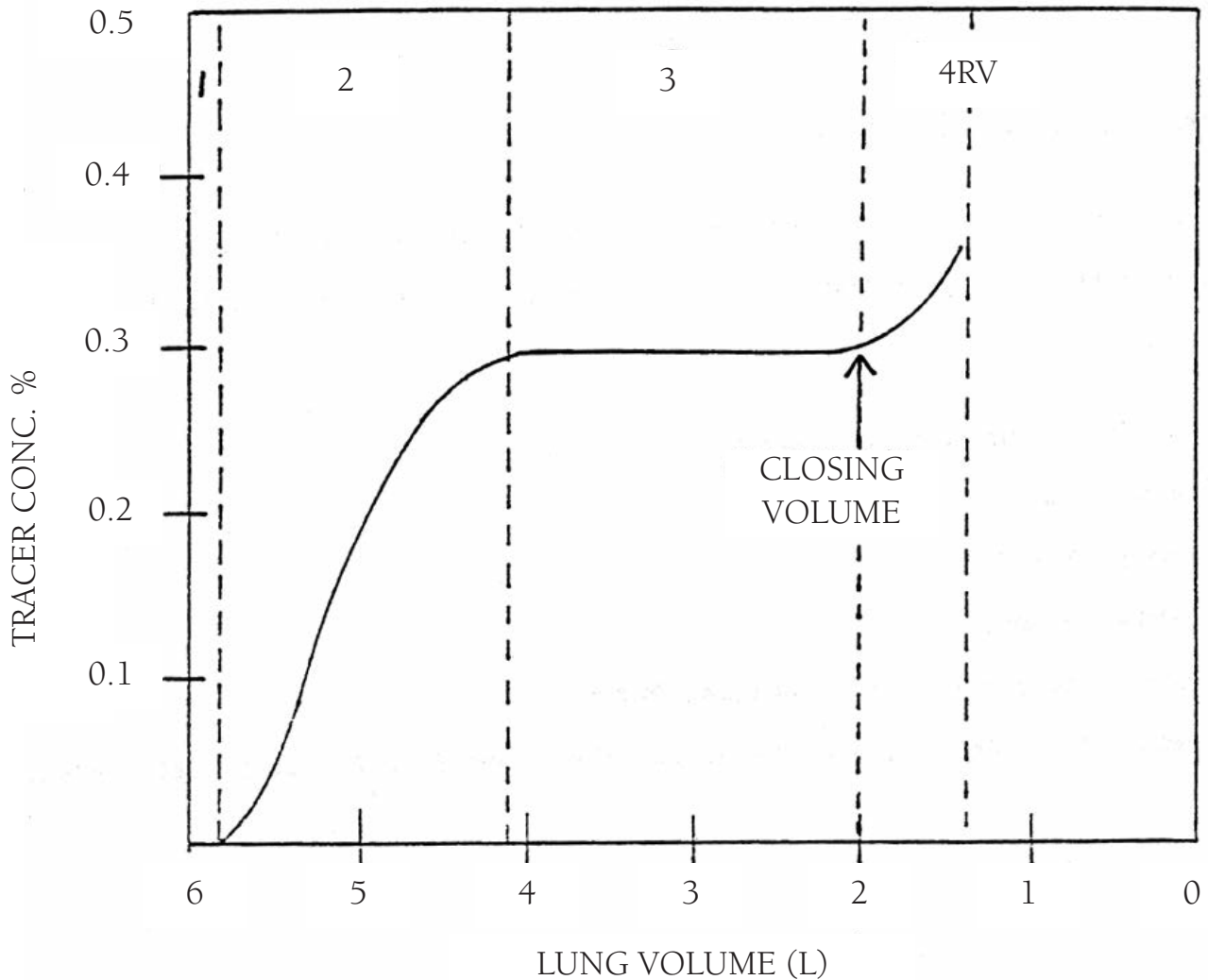
B. Sarcoidosis

C. Pneumothorax

D. Kyphoscoliosis

E. Neuromuscular – Polio, Guillian Barre.

Amyotrophic lateral sclerosis, myasthenia gravis, muscular dystrophies.

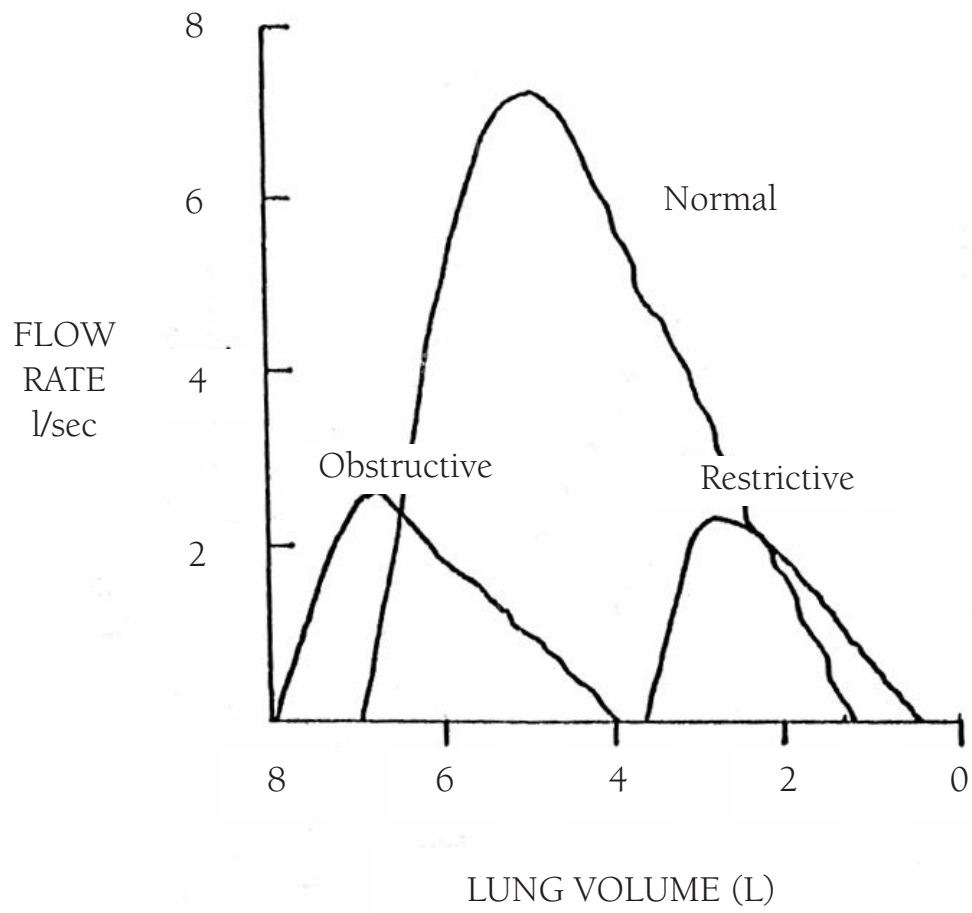


Patient takes a full inspiration from residual volume, and at the start of inspiration, a small bolus of He is injected into the inspired mixture.

Four phases noted in expiration:

- (1) Pure dead space
- (2) Mixture of dead space and alveolar gas
- (3) Pure alveolar gas
- (4) Closing Volume -- signals closure of airways at the base of the lung and is caused by preferential emptying of the apex which has a relatively high concentration of tracer.

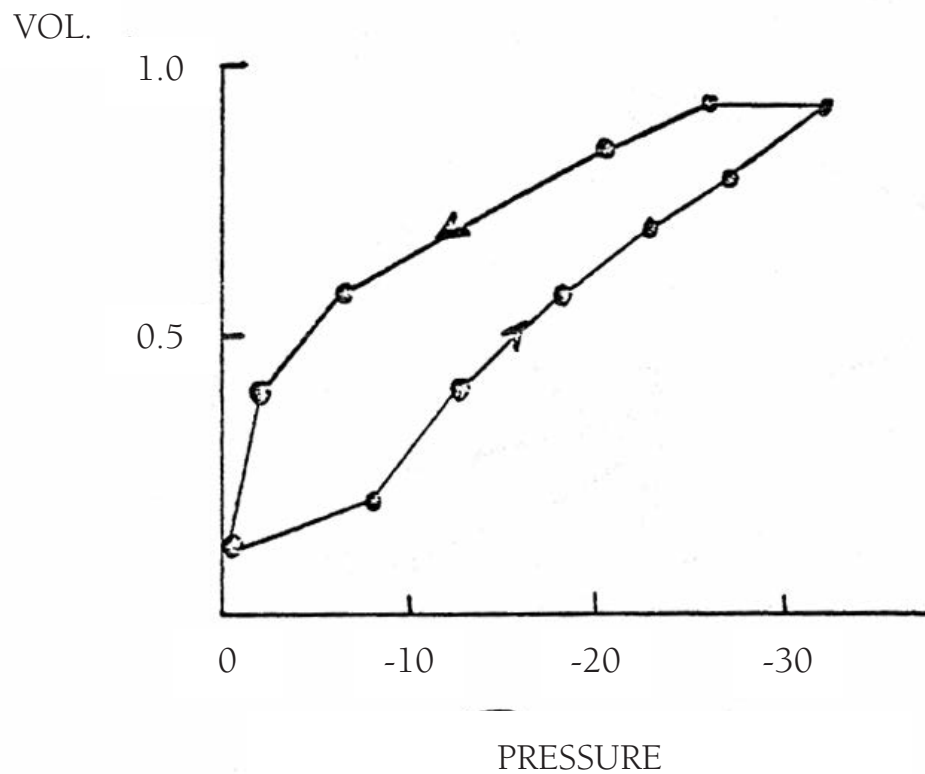
FLOW - VOLUME CURVE



MECHANICS OF BREATHING

Lung Compliance - Volume change per unit of pressure change across lung.

Measure: Intrapleural pressure (esophageal balloon) and inspiration and expiration volumes simultaneously.



PFT

Christine Dorsey -- 25 year old teacher with bronchial asthma.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>
Vital Cap. (L)	3.15	2.40	76.19%
Inspir. Cap. (L)	2.10	1.80	85.71%
Exp. Res. Vol. (L)	1.05	0.60	57.14%
Peak Flow (L/sec)	6.51	2.00	30.72%
Mid Flow (L/sec)	3.31	0.80	24.16%
FEV ₁	2.55	1.20	47.03%
FEV ₁ %	81.00%	50.00%	
FEV ₃	2.99	1.80	60.15%
FEV ₃ %	95.00%	75.00%	

PFT

Malana Pettit -- 37 year old asthmatic.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>
Vital Cap. (L)	3.03	2.70	89.10%
Inspir. Cap. (L)	2.02	2.20	108.91%
Exp. Res. Vol. (L)	1.01	0.50	49.50%
Peak Flow (L/sec)	5.92	5.70	96.28%
Mid Flow (L/sec)	2.91	3.40	116.83%
FEV ₁	2.45	2.30	93.71%
FEV ₁ %	81.00%	85.18%	
FEV ₃	2.87	2.60	90.32%
FEV ₃ %	95.00%	96.29%	

PFT

Vest Westly -- 71 year old with a diagnosis of Silicosis due to coal mining.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>
Vital Cap. (L)	3.73	2.20	58.98%
Inspir. Cap. (L)	2.49	1.50	60.24%
Exp. Res. Vol. (L)	1.24	0.70	56.45%
FRC (L)	3.62	4.04	111.60%
Res. Vol. (L)	2.37	3.34	140.92%
TLC (L)	6.10	5.54	90.81%
RV/TLC (L)	38.85%	60.29%	
Peak Flow (L/sec)	4.94	2.40	48.58%
Mid Flow (L/sec)	2.51	0.50	19.92%
FEV (L)	3.02	1.10	36.40%
FEV ₁ %	81.0	50.00%	
FEV ₃ (L)	3.54	1.6	45.15%
FEV ₃ %	95.00	72.72%	
Diffusing Cap. (ml/min/mmHg)	20.61	16.32	
He mixing Efficiency			
VT (act)	VT (eff)	M.E.	D.S.
.52	.22	.63	.3
ABG pH	pO ₂	pCO ₂	HCO ₃
7.37	69	32	17.9

PFT

Calvin Weber -- 29 year old cook with a history of sarcoid.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>	
Vital Cap. (L)	5.38	2.20	44.6%	
Inspir. Cap. (L)	3.59	1.50	33.42%	
Exp. Res. Vol. (L)	1.79	0.70	67.03%	
FRC (L)	3.83	4.04	71.01%	
Res. Vol. (L)	2.04	3.34	74.50%	
TLC (L)	7.42	5.54	52.83%	
RV/TLC (%)	27.49%	60.29%		
Peak Flow (L/sec)	7.74	2.40	37.46%	
Mid Flow (L/sec)	4.74	0.50	14.76%	
FEV ₁	4.35	1.10	32.12%	
FEV ₁ %	81.00%	50.00%		
FEV ₃	5.11	1.6	37.17%	
FEV ₃ %	95.00%	72.72%		
Diffusing Cap.				
(ml/min/mmHg)	29.22%	11.68%		
He mixing Efficiency				
VT (act)	VT (eff)	M.E.	D.S.	
.51	.1	.31	.41	
ABG	pH	pO ₂	pCO ₂	HCO ₃
Resting	7.45	81	28	18.9
Exercise	7.37	41	32	17.9

Exercise Level: 2.5 MPH for 2 min. at 12 degree incline

PFT

Mr. E. C. -- a 57 year old rodsetter with a diagnosis of diffuse Ca.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>	
Vital Cap. (L)	4.35	2.75	63.21%	
Inspir. Cap. (L)	2.90	2.45	84.48%	
Exp. Res. Vol. (L)	1.45	0.30	20.68%	
FRC (L)	3.75	2.01	53.60%	
Res. Vol. (L)	2.30	1.71	74.34%	
TLC (L)	6.65	4.46	67.06%	
RV/TLC (%)	34.59%	38.34%		
Peak Flow (L/sec)	5.92	4.40	74.32%	
Mid Flow (L/sec)	3.30	1.20	36.36%	
FEV ₁ (L)	3.52	1.75	49.66%	
FEV ₁ %	81.00%	63.63%		
FEV ₃	4.13	2.55	61.70%	
FEV ₃ %	95.00%	92.72%		
Diffusing Cap.				
(ml/min/mmHg)	23.72%	11.18	47.13%	
He mixing Efficiency				
VT (act)	VT (eff)	M.E.	D.S.	
.98	.46	.31	.52	
ABG	pH	pO ₂	pCO ₂	HCO ₃
	7.43	75	31	19.9

PFT

Herman Hudson -- 70 year old patient with a history of COPD and a 75 pack year smoking history.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>
Vital Cap. (L)	4.22	1.65	39.09%
Inspir. Cap. (L)	2.81	1.20	42.70%
Exp. Res. Vol. (L)	1.41	0.45	31.91%
FRC (L)	4.01	6.28	156.60%
Res. Vol. (L)	2.60	5.83	224.23%
TLC (L)	6.82	7.48	109.67%
RV/TLC (%)	38.12%	77.94%	
Peak Flow (L/sec)	5.29	2.00	37.80%
Mid Flow (L/sec)	2.88	0.30	10.41%
FEV (L)	3.41	0.60	17.55%
FEV%	81.00%	36.36%	
FEV ₃	4.00	1.20	29.93%
FEV ₃ %	95.00%	72.72%	
He mixing Efficiency			
VT (act)	VT (eff)	M.E.	D.S.
.51	.14	.42	.37

PFT

Sarah P. -- 49 year old clerk with a 20 pack year smoking history.

<u>Test</u>	<u>Normal</u>	<u>Patient</u>	<u>%Normal</u>	
Vital Cap. (L)	2.56	2.35	91.79%	
Inspir. Cap. (L)	1.71	1.72	100.58%	
Exp. Res. Vol. (L)	0.85	0.63	74.11%	
FRC (L)	2.35	3.28	139.57%	
Res. Vol. (L)	1.50	2.65	176.66%	
TLC (L)	4.07	5.00	122.85%	
RV/TLC (%)	36.00%	53.00%		
Peak Flow (L/sec)	5.13	2.00	38.98%	
Mid Flow (L/sec)	2.28	0.30	13.15%	
FEV ₁ (L)	2.07	0.84	40.50%	
FEV ₁ %	81.00%	35.74%		
FEV ₃ (L)	2.43	1.40	57.56%	
FEV ₃ %	95.00%	59.57%		
MBC	108.84			
Diffusing Cap.				
(ml/min/mmHg)	17.16	12.07	70.36%	
He mixing Efficiency				
VT (act)	VT (eff)	M.E.	D.S.	
.55		.18	.48	
ABG	pH	pO ₂	pCO ₂	HCO ₃
Resting	7.46	71	33	22.8
Exercise	7.36	54	32	17.5

PFT

Henry Scott -- 49 year old tailor.

<u>Test</u>	<u>Normal</u>	<u>Before Isuprel</u>	<u>After Isuprel</u>	<u>%Normal (Before)</u>
Vital Cap. (L)	3.88	1.40	1.45	36.84%
Inspir. Cap. (L)	2.53	0.90	.095	35.57%
Exp. Res. Vol. (L)	1.26	0.50	0.50	39.68%
FRC (L)	3.05	1.78	-----	58.36%
Res. Vol. (L)	1.78	1.28	-----	71.91%
TLC (L)	5.58	2.68	-----	48.02%
RV/TLC (%)	31.89%	47.76%	-----	149.72%
Peak Flow (L/sec)	5.90	3.60	3.50	61.01%
Mid Flow (L/sec)	3.13	2.20	2.00	70.28%
FEV ₁ (L)	3.07	1.15	1.25	37.36%
FEV ₁ %	81.00%	82.14%		
FEV ₃	3.61	1.35	1.40	37.39%
FEV ₃ %	95.00%	96.43%		
Diffusing Cap. (ml/min/mmHg)	22.36	11.13	-----	49.81%
He mixing Efficiency				
VT (act)	VT (eff)	M.E.	D.S.	
.36	----	.41	.48	
ABG	pH	pO ₂	pCO ₂	HCO ₃
	7.48	61	29	20.9

PFT

Joe Dougherty -- 53 year old truck driver with a 28 year smoking history of 1 to 2 packs per day.

<u>Test</u>	<u>Normal</u>	<u>Before Isuprel</u>	<u>After Isuprel</u>	<u>%Normal (Before)</u>
Vital Cap. (L)	4.49	3.00	3.50	66.81%
Inspir. Cap. (L)	2.99	2.40	2.80	80.26%
Exp. Res. Vol. (L)	1.50	0.60	0.70	40.00%
FRC (L)	3.75	4.80	-----	128.00%
Res. Vol. (L)	2.26	4.20	-----	185.84%
TLC (L)	6.75	7.20	-----	106.66%
RV/TLC (%)	33.48%	58.33%	-----	174.22%
Peak Flow (L/sec)	6.17	3.40	3.80	55.10%
Mid Flow (L/sec)	3.51	0.30	0.60	8.54%
FEV ₁ (L)	3.63	1.30	1.70	35.74%
FEV ₁ %	81.0%	43.33%	48.57%	
FEV ₃	4.26	2.00	2.55	46.88%
FEV ₃ %	95.0%	66.67%	72.86%	
Diffusing Cap. (ml/min/mmHg)	24.48	27.23	-----	111.27%
He mixing Efficiency	VT (act) .68	VT (eff) .13	M.E. .26	D.S. .55
ABG	pH 7.41	pO ₂ 77	pCO ₂ 36	HCO ₃ 22.1

PFT

Mr. Frank T. -- 59 year old smoker.

<u>Test</u>	<u>Normal</u>	<u>Before Isuprel</u>	<u>After Isuprel</u>	<u>%Normal (Before)</u>
Vital Cap. (L)	4.20	2.50	2.85	59.52%
Inspir. Cap. (L)	2.80	2.40	2.65	85.71%
Exp. Res. Vol. (L)	1.40	0.10	0.20	7.41%
FRC (L)	3.68	2.91	-----	79.07%
Res. Vol. (L)	2.28	2.81	-----	123.24%
TLC (L)	6.48	5.31	-----	81.94%
RV/TLC (%)	35.18	52.91	-----	150.40%
Peak Flow (L/sec)	5.74	5.20	5.00	90.59%
Mid Flow (L/sec)	3.15	1.00	2.40	31.74%
FEV ₁ (L)	3.40	1.85	2.00	54.37%
FEV ₁ %	81.00%	74.00%	70.18%	
FEV ₃ (L)	3.99	2.30	2.55	57.54%
FEV ₃ %	95.00%	92.00%	89.47%	
Diffusing Cap. (ml/min/mmHg)	23.07	22.90	-----	99.28%
He mixing Efficiency				
VT (act)	VT (eff)	M.E.	D.S.	
.56	.11	.29	.45	
ABG	pH	pO ₂	pCO ₂	HCO ₃
Resting	7.45	66	28	18.9
Exercise	7.43	57	34	21.9
Exercise level: 2.5 MPH for 3 min. at 0 degree incline				

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: THOMAS SNIPES                HOSP. NO: O.P.
ROOM: O.P.                        PHYSICIAN: DR. SIMELARO
AGE:  48.0                        SEX: MALE
DATE: 6/15/77                     DIAG: C.O.P.D.

```

```

.....
TEST                NORMAL                PATIENT        %NORMAL
VITAL CAPACITY (LITERS)  4.99                0.91          18.2   %
PEAK FLOW (L./SEC)      6.70                2.17          32.4   %
MID FLOW (L./SEC)       3.98                0.24          6.1    %
FEV1.0                 76% OF V.C.         0.38          41.8   %
V.C.
FEV3.0                 91% OF V.C.         0.63          69.2   %
V.C.
F.R.C.                 4.03                5.89          146.09 %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: VERNELLE SMITH          HOSP. NO: 04774-
ROOM: 305                     PHYSICIAN: DR. SIMELARO
AGE:  54.0                    SEX: FEMALE
DATE: 2/25/77                 DIAG: PULMONARY FIBROSIS
.....

```

TEST	NORMAL	PATIENT	%NORMAL
VITAL CAPACITY (LITERS)	2.77	1.69	61.0 %
PEAK FLOW (L./SEC)	5.05	4.10	81.1 %
MID FLOW (L./SEC)	2.30	2.89	125.7 %
FEV1.0	76% OF V.C.	1.32	78.1 %
V.C.			
FEV3.0	91% OF V.C.	1.69	100.0 %
V.C.			
F.R.C.	2.71	1.60	58.87 %
R.V.			
N2 INDEX (%)	2%		
DCO			

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: MARY WAYMAN                HOSP. NO: O.P.
ROOM: O.P.                      PHYSICIAN: DR. VERMEIRE
AGE:  45.0                      SEX: FEMALE
DATE: 5/18/77                   DIAG: CHRONIC BRONCHITIS

```

```

.....
TEST                NORMAL          PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  2.96          1.15      38.9   %
PEAK FLOW (L./SEC)      5.55          1.20      21.6   %
MID FLOW (L./SEC)       2.66          .300      11.3   %
FEV1.0                 76% OF V.C.   0.600     52.2   %
V.C.
FEV3.0                 91% OF V.C.   1.05      91.3   %
V.C.
F.R.C.                 2.69          3.58     133.06 %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

NAME: ROBERT SLAY	HOSP. NO: 001849
ROOM: 445C	PHYSICIAN: DR. W. DICKERSON
AGE: 70.0	SEX: MALE
DATE: 9/22/76	

TEST	NORMAL	PATIENT	%NORMAL
VITAL CAPACITY (LITERS)	3.31	0.97	29.3 %
PEAK FLOW (L./SEC)	4.72	3.61	76.6 %
MID FLOW (L./SEC)	2.25	0.72	32.1 %
FEV1.0	86% OF V.C.	0.85	87.6 %
V.C.			
FEV3.0	91% OF V.C.	0.97	100.0 %
V.C.			
F.R.C.	3.23	4.38	135.55 %
R.V.			
N2 INDEX (%)	2%		
DCO			

34.

NAME: GLADYS RAND	HOSP. NO: O.P.
ROOM: O.P.	PHYSICIAN: DR. FORE
AGE: 56.0	SEX: FEMALE
DATE: 5/4/77	DIAG: PULMONARY FIBROSIS

.....

INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

.....
NAME: RODY RYAN

HOSP. NO: O.P.

ROOM: O.P.

PHYSICIAN: DR. TOMEI

AGE: 67.0

SEX: MALE

DATE: 12/28/77

DIAG: C.O.P.D.

TEST	NORMAL	PATIENT	%NORMAL
VITAL CAPACITY (LITERS)	3.91	1.51	38.6 %
PEAK FLOW (L./SEC)	5.22	3.37	64.6 %
MID FLOW (L./SEC)	2.74	0.12	4.4 %
FEV1.0	76% OF V.C.	0.67	44.4 %
FEV3.0	91% OF V.C.	1.07	70.9 %
F.R.C.	3.65	4.65	127.49 %
R.V.			
N2 INDEX (%)	2%		
DCO			

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: SAMUEL MILLER                HOSP. NO: O.P.
ROOM: O.P.                        PHYSICIAN: DR. SIMELARO
AGE: 64.0                          SEX: MALE
DATE: 6/8/77                       DIAG: EVALUATION

```

```

.....
TEST                NORMAL                PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  3.78                2.16        57.1    %
PEAK FLOW (L./SEC)      5.26                3.86        73.3    %
MID FLOW (L./SEC)       2.73                1.69        61.8    %
FEV1.0                 76% OF V.C.        1.60        74.1    %
V.C.
FEV3.0                 91% OF V.C.        1.94        89.8    %
V.C.
F.R.C.                 3.46                2.72        78.52   %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: STEVEN TENNIS                HOSP. NO: 002113
ROOM: 504                          PHYSICIAN: DR. R. ERWIN
AGE: 56.0                          SEX: MALE
DATE: 10/6/76                      DIAG: PRE-Op/HERNIA

```

```

.....
TEST                NORMAL                PATIENT        %NORMAL
VITAL CAPACITY (LITERS)  4.28                1.47            34.3   %
PEAK FLOW (L./SEC)      5.92                4.34            73.3   %
MID FLOW (L./SEC)       3.28                0.36            11.0   %
FEV1.0                 76% OF V.C.         0.88            59.9   %
V.C.
FEV3.0                 91% OF V.C.         1.47            100.0  %
V.C.
F.R.C.                 3.66                6.76            184.71 %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

.....
NAME: JUSTINE BAKER

HOSP. NO: O.P.

ROOM: O.P.

PHYSICIAN: 48TH-#4

AGE: 18.0

SEX: FEMALE

DATE: 6/14/77

DIAG: SARCOID

TEST	NORMAL	PATIENT	%NORMAL
VITAL CAPACITY (LITERS)	3.64	2.57	70.6 %
PEAK FLOW (L./SEC)	7.11	4.34	61.0 %
MID FLOW (L./SEC)	3.83	3.01	78.6 %
FEV1.0	76% OF V.C.	2.21	86.0 %
V.C.			
FEV3.0	91% OF V.C.	2.57	100.0 %
V.C.			
F.R.C.	2.76	1.78	64.58 %
R.V.			
N2 INDEX (%)	2%		
DCO			

.....

INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: CLAIR GROSS                HOSP. NO: O.P.
ROOM: O.P.                      PHYSICIAN: DR. SIMELARO
AGE:  53.0                      SEX: MALE
DATE:  4/25/77                 DIAG: ASTHMA

```

```

.....
TEST                NORMAL                PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  4.48                3.42        76.3    %
PEAK FLOW (L./SEC)      6.17                5.78        93.7    %
MID FLOW (L./SEC)       3.50                1.08        31.0    %
FEV1.0                 76% OF V.C.        1.85        54.1    %
V.C.
FEV3.0                 91% OF V.C.        2.67        78.1    %
V.C.
F.R.C.                 3.74                4.27        114.18 %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: JOSEPH GLOVER                HOSP. NO: 003686
ROOM: 366                          PHYSICIAN: DR. DICKERSON
AGE: 68.0                          SEX: MALE
DATE: 1/14/77                      DIAG: BRONCHITIS

```

```

.....
TEST                NORMAL                PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  3.56                1.42        39.9    %
PEAK FLOW (L./SEC)      4.95                2.89        58.4    %
MID FLOW (L./SEC)       2.47                0.72        29.3    %
FEV1.0                 76% OF V.C.         0.77        54.2
% V.C.
FEV3.0                 91% OF V.C.         1.24        87.3    %
V.C.
F.R.C.                 3.38                *****    ***** %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: ANTHONY MITCHELL          HOSP. NO: O.P.
ROOM: O.P.                     PHYSICIAN: DR. MARTINI
AGE:  66.0                     SEX: MALE
DATE: 3/15/78                  DIAG: PNEUMOCONIOSIS

```

```

.....
TEST          NORMAL          PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  4.00          2.77      69.2   %
PEAK FLOW (L./SEC)      5.32          5.30      99.6   %
MID FLOW (L./SEC)       2.83          0.86      34.1   %
FEV1.0              76% OF V.C.    1.71      61.7   %
V.C.
FEV3.0              91% OF V.C.    2.33      84.1   %
V.C.
F.R.C.              3.70          *****  ***** %
R.V.
N2 INDEX (%)         2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: HARIETT HAYES                HOSP. NO: 010033
ROOM: 313B                        PHYSICIAN: DR. SIMELARO
AGE: 47.0                          SEX: FEMALE
DATE: 2/9/78                      DIAG: ASTHMA

```

```

.....
TEST                NORMAL                PATIENT        %NORMAL
VITAL CAPACITY (LITERS)  2.92                1.45          49.7   %
PEAK FLOW (L./SEC)      5.44                1.80          33.1   %
MID FLOW (L./SEC)       2.58                .400          15.5   %
FEV1.0                 76% OF V.C.         .750          51.7   %
V.C.
FEV3.0                 91% OF V.C.         1.25          86.2   %
V.C.
F.R.C.                 2.70                *****      ***** %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: JOSEPH GLOVER                HOSP. NO: 003686
ROOM: 316                          PHYSICIAN: DR. DICKERSON
AGE: 68.0                          SEX: MALE
DATE: 1/7/77                       DIAG: EVALUATION

```

```

.....
TEST                NORMAL                PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  3.56                1.13        31.7    %
PEAK FLOW (L./SEC)      4.95                2.17        43.8    %
MID FLOW (L./SEC)       2.47                1.08        43.9    %
FEV1.0                 76% OF V.C.         0.76        67.3    %
V.C.
FEV3.0                 91% OF V.C.         1.13        100.0   %
V.C.
F.R.C.                 3.38                1.95        57.57   %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: ANN LANDS                HOSP. NO: O.P.
ROOM: O.P.                     PHYSICIAN: DR. SIMELARO
AGE:  56.0                     SEX: FEMALE
DATE: 2/16/78                  DIAG: EVALUATION

```

```

.....
TEST                NORMAL                PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  2.89                1.29        44.6   %
PEAK FLOW (L./SEC)      5.04                3.37        66.9   %
MID FLOW (L./SEC)       2.32                2.05        88.3   %
FEV1.0                 76% OF V.C.         1.24        96.1   %
V.C.
FEV3.0                 91% OF V.C.         1.29        100.0  %
V.C.
F.R.C.                 2.89                1.63        56.24  %
R.V.
N2 INDEX (%)           2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

.....
NAME: ANN LANDS

HOSP. NO: 05628-

ROOM: 306

PHYSICIAN: DR. JAMA

AGE: 55.0

SEX: FEMALE

DATE: 4/7/77

DIAG: PRE-Op

TEST	NORMAL	PATIENT	%NORMAL
VITAL CAPACITY (LITERS)	2.91	2.13	73.2 %
PEAK FLOW (L./SEC)	5.09	3.86	75.7 %
MID FLOW (L./SEC)	2.36	1.20	51.1 %
FEV1.0	76% OF V.C.	1.69	79.3 %
V.C.			
FEV3.0	91% OF V.C.	2.13	100.0 %
V.C.			
F.R.C.	2.89	2.50	86.35 %
R.V.			
N2 INDEX (%)	2%		
DCO			

.....

INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: NICHOLAS MINGONE          HOSP. NO: 003616
ROOM: 406                      PHYSICIAN: DR. YOUNG, SR.
AGE: 70.0                      SEX: MALE
DATE: 1/4/76                   DIAG: PROSTATIC DISEASE

```

```

.....
TEST          NORMAL          PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  2.92          0.79      27.1   %
PEAK FLOW (L./SEC)      4.47          2.89      64.7   %
MID FLOW (L./SEC)       1.98          1.33      66.9   %
FEV1.0             76% OF V.C.    0.74      93.7   %
V.C.
FEV3.0             91% OF V.C.    0.79      100.0  %
V.C.
F.R.C.             2.89          1.26      43.48  %
R.V.
N2 INDEX (%)        2%
DCO

```

.....
INTERPRETATION

HOSPITAL OF THE
PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
PULMONARY FUNCTION LABORATORY

```

.....
NAME: PAUL MILLARD                HOSP. NO: 7685
ROOM: 515                        PHYSICIAN: DR. DICKERSON
AGE: 71.0                        SEX: MALE
DATE: 8/12/77                    DIAG: COPD

```

```

.....
TEST          NORMAL          PATIENT    %NORMAL
VITAL CAPACITY (LITERS)  4.15          1.25      30.1   %
PEAK FLOW (L./SEC)      5.20          1.10      21.2   %
MID FLOW (L./SEC)       2.80          .300      10.7   %
FEV1.0             76% OF V.C.    .550      44.0   %
V.C.
FEV3.0             91% OF V.C.    1.00      80.0   %
V.C.
F.R.C.             3.97          *****  ***** %
R.V.
N2 INDEX (%)        2%
DCO

```

.....
INTERPRETATION

PHILADELPHIA COLLEGE OF OSTEOPATHIC MEDICINE
DIVISION OF PULMONARY DISEASES
PULMONARY FUNCTION LABORATORY

Name: _____ Date: _____
Physician: _____ Hospital No: _____

Height: _____ _____ Male
Weight: _____ _____ Female
Age: _____

Diagnosis: _____
Occupation: _____

SMOKING HISTORY:

_____ cigarettes _____ packs per day
_____ cigars _____ pack years
_____ pipe _____ cigars per day
_____ never smoked
_____ smokes but does not inhale

Dyspnea _____ no _____ yes - If yes onset _____

Occurrences:

_____ resting
_____ walking/exercise
_____ emotional upsets
_____ seasonal changes
_____ nocturnal
_____ other: _____

Cough _____ no _____ yes - If yes onset _____

_____ non-productive
_____ wheezing
_____ accompanied with dyspnea

Lung Fields:

Right _____
Left _____

MEDICATIONS: _____

ALLERGIES: _____

PREVIOUS PULMONARY ILLNESS: _____

COMMENTS: _____

GRADUATE HEALTH SYSTEMS -- CITY AVENUE HOSPITAL
PULMONARY LABORATORY
BEDSIDE SPIROMETRY

NAME:
HOSPITAL NUMBER:
DOCTOR:
ROOM:

AGE:
HEIGHT:
WEIGHT:
SEX:

PRE BRONCHODILATOR				POST BRONCHODILATOR	
	PRED	ACTUAL	PERCENT %	ACTUAL	PERCENT %
FVC					
FEV ₁					
FEF _{25-75%}					
PEAK FLOW					

INTERPRETATION:

<u>PRE-GRAPH</u>	<u>POST-GRAPH</u>
------------------	-------------------

John P. Simelaro, D.O.
Director, Pulmonary Division